

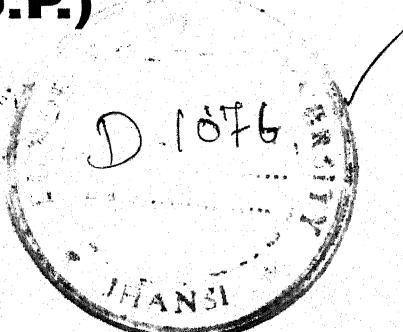
TRIPLE PROCEDURE IN PATIENTS OF GLAUCOMA WITH SENILE CATARACT (A CLINICAL STUDY)

Thesis for
MASTER OF SURGERY
(OPHTHALMOLOGY)



2001

**Bundelkhand University
Jhansi (U.P.)**

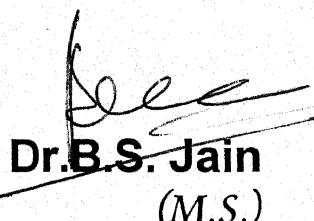


सतनाम् श्री वाहेगुरु

CERTIFICATE

Certified that the research work entitled "Triple procedure in patients of glaucoma with senile cataract (A Clinical Study)" which is being submitted as thesis for M.S. (Ophthalmology) Examination of Bundelkhand University, 2001 by Dr. NEERAJ CHOWDHRY has been carried out in the department of Ophthalmology, M.L.B. Medical College, Jhansi.

He has put in the necessary stay in this department as per university regulations.

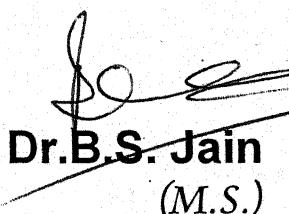


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CERTIFICATE

Certified that the research work entitled "Triple procedure in patients of glaucoma with senile cataract (A Clinical Study)" was conducted by Dr. NEERAJ CHOWDHRY under my guidance and Supervision. The investigations, techniques and statistics mentioned in the thesis were actually undertaken by candidate himself and the observations have been checked by me regularly.



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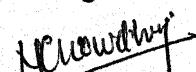
task. His discerning criticism ,seasoned rationale and affectionate nature were a constant beacon of moral support to me.

All of my colleagues and friends, Whose co-operation and painstaking help are unaccountable, deserve a special word of thanks.

At this moment of glory and award I humbly accept that all credit actually goes to my parents, brother Pankaj, wife Geetika and friend Vijay. Their affection , sacrifices and patience have made all this worthwhile.

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The entire manuscript has been computerized typed in an exemplary manner by Mr. Rajendra Kumar Rai. I am highly thankful to him for his patience and untiring efforts.



Neeraj Chowdhry

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INTRODUCTION

INTRODUCTION

Glaucoma and cataract have affected the mankind ever since the emergence on the face of the earth. But their true nature was not recognised by ancient Greeks and Romans. The word Glaucoma first appeared in Hippocrates {420 B.C.} together with the cataract in the list of disease affecting the old people.

Glaucoma is an ancient greek noun meaning glaze such as silveryness of the sky or dull sheen of an eye. Which has lost its brightness. Glaucoma is no definite morbid entity but merely the off colour, lack lustre and appearance of the eye turned blind.

What is glaucoma - Glaucoma is not a disease but it is a symptom complex in which any tension which is not compatible with normal physiological functioning of the eye with diurnal variation of more than 5 mm Hg and field changes are there.

The two main types of glaucoma are -

- Congenital
- Acquired

Further subclassified as open angle and angle closure

The glaucoma may also be primary or secondary depending on the presence or absence of associated factors contributing to the pressure rise.

What is cataract - Any opacity in the lens or its capsule whether developmental or acquired is called cataract.

Glaucoma and cataract are often separated as surgical entities for one requires a wound that leaks and the other a wound completely water tight. However their frequent coexistence has led to the wealth of ideas as to how best to control the Glaucoma and at the same time improve the vision. There fore, some how or the other one has to resort to the surgical treatment of the condition.

The surgical form of the treatment for relieving this condition has to pass the mandatory course of evolution to the present status.

First for glaucoma various procedures came such as trephining in 1909 ; this remained popular for half a century- Then iridenclesis and Scheie's operation - cannot settle the struggle. Then most celebrated entry of

trabeculectomy revolutionised the mode of surgical treatment and prognosis.

The earliest record of operative treatment for cataract was in ancient India. This consisted of dislodging the opaque lens into the vitreous cavity. This method known as couching prevailed until the middle of 18th century when Davel planned extracapsular cataract extraction {ECCE} through the limbal incision. During the next 150 years the development of instrumentation together with refinement of Davel's original procedure brought cataract surgery into pre-modern era.

Prior to 1940 ECCE was the only procedure. Major draw back of this technique was the necessity to delay the surgery till the cataract was mature. The intra capsular technique was a great advance in cataract surgery. Futher refinement of intra capsular technique continued till late 60's.

- Arugas capsular holding method.
- Indian smith tumbling method.
- Wire vectis .
- Irisephake.
- Cryoexhtraction.

Ridley did ECCE to accomodate is posterior chamber lens, but ridley's lenses did not get popularity because majority of eye surgeous could not use his lens as they were intracapsularists. Choyce designed anterior chamber lenses to be implanted after intra capsular extraction. Binkhorst's iris clip lens to be used after intracapsualr extraction has been modified by removing the two anterior clips to be used after Extracapsular extraction. After introduction of operating microscope for ophthalmic surgery ECCE reappeared in a modern way. Improved technology evolved for opening the anterior capsule to bring out nucleus and cortical matter to have a clear transparent posterior capsule and put an intraocular lens in the capsular bag.

The relationship between the glaucoma and cataract is very close. The combination of glaucoma and cataract in the same patient is not infrequent. Management of glaucoma coexisting with the cataract simultaneously in a patient poses the problem, whether to perform the glaucoma and cataract surgeries at the same time or to do one operation first followed by the second at the later date. One answer to dilema in these cases is combined glaucoma and cataract operation. It has been attempted with varying degrees of success, encouraged

by the good results and low rate of complication of single stage surgery. This has been favoured by many surgeons because of various advantages {Sorsby 1967}. Such as - one surgical and psychological trauma to the patient, short stay at hospital, so reduction of cost, avoidance of malignant glaucoma, avoidance of second stage operation in high risk patients, avoidance of prolonged medication and early restoration of vision. Eye is only once exposed to the hazards of surgery - Such as iritis, corneal problems, infections etc.

Most glaucoma procedures have been combined with cataract extraction including trephining, iridencleisis. Sclerotomy, combined sclerotomy and iris inclusion and scleral cauterisation. Each of these is a filtering procedure and has the problems of attempting to produce a tight cataract wound and a filtering wound. In 1968 Cairns introduced the trabeculectomy, which has the advantage of a guarded filtering wound. This possibly avoided shallow or flat anterior chamber, post operatively. Several authors in recent past have tried trubeculectomy in combination with cataract cataract and lens implantation. Steighler (1978) has reported favourable results combining the insertion of kelman II anterior chamber

lens when intracapsular cataract extraction was combined with trabeculectomy.

In 1979 Pereival succinctly summarized the practical problems and De Heer reviewed the limited reports on various lens types.

The results shown by different authors were encouraging. So this procedure of cataract operation extraction with lens implantation along with trabeculectomy was performed in the present study for its further evaluation.



REVIEW OF LITERATURE

REVIEW OF LITERATURE

Cataract may be simply defined as an opacity in the lens. it is the most common and fortunately one of the most easily remedied cause of visual incapacity and blindness.

Though the history of cataract treatment goes back some 4000 years or probably further. This was in Hindu medicine in which Sushrute defined cataract as an opacity of lens due to derangement of intraocular fluid. He used to treat it surgically by couching .

The term glaucoma, first used in the Hippocratic writings, as yhavkwaa {glaucoma} was used to describe blindness coming on in advancing years associated with glazed appearance of the pupil {Duke Elder 1969}. Originally both diseases glaucoma and cataract considered in the lens. Only at a later date, it was differentiated by Celsus (25 B.C. A.D. 50) and rufos (A.D. 95-117) and later by Galen (A.D. 131-210).

The first suggestion about glaucoma, that the disease is associated with a rise in intraocular pressure seems to occur in the Arabian writing of At Tobari (10th century). The first

original and clear recognition of such a condition in European writings, however is due to Richard Bamister 1622. The first original and clear recognition of glaucoma with raised ocular tension was given by Antoine - pierre Demours (1818) and clinical picture was the appearance of the colour of rainbow around lights.

After the introduction of ophthalmoscope Heinrich muller (1856) observed the phenomenon of cupping of optic disc.

The medical therapy for glaucoma was started by Adolfweber (1876) and advocated the use of the extract of Jaborandi (Pilocarpine). The surgical therapy for glaucoma started by William Mackenzie (1830) who introduced sclerotomy to relief the raised intra ocular tension. The modern surgical therapy for glaucoma was started by Curan (1920). who introduced peripheral iridectomy to reestablish the communication between posterior and anterior chamber. While Jacques Daviel (1748-53) a French surgeon introduced a new technique for the extraction of cataract.

The association of glaucoma with cataract is a common combination. These two coexisting condition have a problem of

treating at simultaneously and the development of cataract may aggravate the preexisting glaucoma.

The combined procedure in 4th or 5th decade of 19th century was not accepted widely. One reason for this, was the view that cataract surgery alone may result in better glaucoma control. Vonlint (1939) stated that if miotics have been able to control intra ocular tension, preoperatively, lens extraction would result in control afterwards. Guyton (1945) also recommended the same procedure in survey of 100 cases of cataract extraction in eyes with chronic open angle glaucoma. Which was controlled medically pre-operatively.

Seudari et al (1967) stated that intra ocular pressure elevated to a higher level than pre operative level 6 month after cataract surgery alone. Becher (1967) reported that glaucoma surgery will be required in some cases even after cataract extraction and the operations available for an aphakic eye are well known to be traumatic and unpredictable in result.

Chandler (1947), Thomas (1947), Sourdille (1950), Heydheoker (1954-56) Mehra and Dutta (1963) recommended that the glaucoma surgery should be undertaken before cataract extraction. There are many objections to this

approach that the patient is exposed to double risk of two operation and filtering operation may itself accelerate the cataract progression (Sugar 1970).

Randolph et al (1971) gave an analysis of 166 eyes treated with various methods have concluded that if a patient has controlled or uncontrolled glaucoma with cataract, a cataract extraction should be done first. The patient with uncontrolled glaucoma with field defects provide the surgeon with the choice of cataract extraction or combined extraction-filtration procedure and it is ideal to obtain a filtering bleb, which will control the intraocular pressure without medications after cataract extraction.

This idea of simultaneous surgery for cataract and glaucoma by one stage operation was obviously attraction and many authors had described such operation in last three decades. The purpose of these operations had been to remove the cataract and at the same time to leave a fistulous channel for the drainage of aqueous.

Wright (1937) described combined extraction iridectomy-sclerotomy for case of cataract and severe glaucoma. In the question and answer section of 1941 issue of Archives of

ophthalmology, a combination of iridencleisis and cataract extraction was recommended for such cases.

In 1952 guyton mentioned the use of combination of cyclodialysis and cataract extraction.

Bierge (1952) , reported the first series of 25 eyes in which cataract extraction and iridenclesis performed simultaneously. In 88% cases glaucoma was controlled without further medical therapy.

Shmeleva (1972) of Russia combined cataract extraction with trabeculectomy. In all cases there was good hypotensive effect.

Jerndal and Ludstrom (1976) combined trabeculectomy with cataract extraction. The pre operative tension ranged between 20-60 mm of Hg. (Average 33 mm Hg). The post operative tension varied between 10-26 mm Hg. The average being 16 mmHg. Visual acuity improved in 14 eyes and unchanged in 2 eyes.

Edwards (1980) extracted 59 cataract with trabeculectomy and follow up period was varying between 6 months to

2 yrs. Visual outcome was better in chronic simple and narrow angle than secondary glaucoma.

Romen et al (1982) combined cataract extraction with trabeculectomy in 46 eyes. Tension turned normal in 33 (71.74%) eyes without drugs.

Skropic C. , Gnad P, Parousis P. Menapace R. evaluated trabeculectomy and intraocular lens implantation a combined procedure in 26 cases in eyes with open angle glaucoma. Phacoemulsification was performed in nine cases and planned ECCE in 17. In 23 eyes the PCIOL was implanted and in 3 eyes an ACIOL was used because of rupture posterior capsule. After a follow up period ranging from 4 to 29 months, the post operative results were satisfactory in all eyes treated. The patients achieved post operative intraocular pressure of 20 mm Hg or less. In 20% of the cases , however additional antiglaucoma medication was required. They interpreted that combined procedure provides effective one time treatment for cataract and glaucoma patients as well as optimal visual rehabilitation.

Civerchia L, Balent A. 1989 performed planned ECCE and PCIOL implantation in 4 eyes of 3 patients under going

surgery of acute angle closure glaucoma associated with cataract. They found no evidence of corneal decompensation, residual glaucoma or increased surgical morbidity in their patients. They concluded that acute glaucoma associated with cataract is not a contra indication to lens implantation.

Mc. Cartney DL, Memmer JE, Stark WJ. Maumence AE, Wong SK evaluated the efficacy and safety of combined trabeculectomy cataract extraction and IOL implantation in 108 consecutive operations. Postoperatively 89% of eyes achieved 6/12 or better visual acuity, Intraocular pressure control { less than or equal to 21 mmHg } was achieved in 92% of eyes.

Simmons ST, Litoff D, Michols DA, Sherwood MB, Speth GL 1987 evaluated ECCE with PCIOL with trabeculectomy in patients with glaucoma. They reviewed 75 consecutive cases of Triple procedure of the 75 eyes, 49 achieved visual acuity of 6/12 or better. Postoperatively IOP was 3.8 mm Hg lower than preoperative level at 2 months.

Wishart PK, Atkinson PL evaluated effect on IOP control in patients of glaucoma who underwent triple procedure in St pauls eye hospital liverpool. 23 eyes with primary chronic

angle closure glaucoma undergoing Triple procedure were studied. The long term effect was that majority achieve. The IOP less than 21 mm Hg.

Murchinson JF, Shields MR evaluated 3 surgical approaches for coexisting cataract and glaucoma in Duke university eye centre, Durham. 78 eyes with coexisting cataract and glaucoma underwent Triple surgery by one surgeon. Conclusion was that the 78% of the eyes underwent triple procedure achieved $IOP < 21\text{mm Hg}$ and visual aquity 6/18 or more.

Longstaff S. Wormald RP. Mozover A. Hitching RA evaluated glaucoma triple procedure, efficacy of IOP control and visual outcome in Moorfields eye Hospital. London, England. They performed 63 triple procedures. Intraocular pressure was controlled satisfactorily in all cases, 25% required additional glaucoma therapy but fewer glaucoma medications. 86% achieved 6/12 or better visual acuity.

Fusco R. Guacci P., Ambrosio G., Murino N. 1990 had long term study of trabeculectomy and extracapsular cataract extraction with posterior chamber lens implantation, in 15 eyes with glaucoma. They interpreted that this procedure

offers the intraocular pressure control expected after trabeculectomy and at the same time gives the patients all visual benefits that cataract extraction with intraocular lens implantation warrants, without introduction of new complications.

Rurrato I., Ferrari M. evaluated extracapsular cataract surgery with PCIOL in glaucomatous eyes that had a filtering bleb operation they evaluated IOP and visual acuity and examined the visual fields during a follow up period of eight months. They compared these results with preoperative measurements. This study demonstrates that ECCE with PCIOL implantation is the optional solution for the eye that have had a filtering bleb operation to obtain a good functional result and IOP stabilization.

Wedrich A. MenapaceR. Radax U. Papapanos P. 1995 combined Trabeculectomy and small incision cataract surgery. They did prospective study of 49 eyes with coexisting cataract and glaucoma, who had combined trabeculectomy, phacoenuclisis and implantation of a folded polyhema intraocular lens through the trabeculectomy opening preoperatively, intraocular pressure was controlled {<20mmHg}

in 13 eyes and uncontrolled (>20 mmHg) in 36 eyes with medications. preoperatively visual acuity ranged from 6/12 to hand movement. At the end of the follow up , IOP was below 18 mmHg in all eyes, without therapy in 39 {80%} and with reduced therapy in 10. Visual acuity was improved in 42 patients. 38 achieved visual acuity of 6/12 or better. So Conclusion was that the combination of small incision cataract surgery and trabeculectomy is a successful surgical approach for long term visual rehabilitation and glaucoma control.

Hornova J., Kuchyuka P., Fucik M. 1995 done cataract extraction and intraocular lens implantation in 77 patient who were sufferers of glaucoma. They concluded that cataract extraction with IOL implantation in glaucoma patients should be combined with trabeculectomy because out of 77 patients operated 49 patients were on antiglaucoma therapy after the operation.

Cernea P and Enache D 1995 evaluated the extraction of crystalline lens with trabeculectomy in open angle glaucoma in 21 patients. The ocular tension before the operation was between 21-30 mm Hg in 15 patients, 31- 40 mm Hg in 4

patients and over 41 mm Hg in 2 patients. The visual acuity was below 2/60 due to opacity of the crystalline lens and the advance stage of the glaucoma. In all cases under observation ocular tension kept within 11-17 mm Hg. and vision was 6/24 or more.

Tanihara H., Negi A., Akimoto M. Nagata M. 1995 evaluated the long term results of combined trabeculectomy ab externo and cataract extraction in adult patients with either primary open angle glaucoma and pseudoexfoliation syndrome, in 60 eyes. IOP was well controlled 21 mm Hg or less in 54 eyes with or without medications.

Storr-Paulsen A., Perriard A, vangsted P did triple procedure in patient of cataract with coexisting open angle glaucoma in 19 eyes. Median decrease in IOP was significant through a 12 months observation period $P<0.001$. They concluded that it seems justified to extend the indication for combined surgery in cataract patients with coexisting open angle glaucoma in cases of uncontrolled IOP, poor compliance , or unacceptable mediation.

Chen W. Lin Z, wang N. Cre J. 1995 Dec. evaluated the effect of trabeculectomy combined with ECCE and PCIOL

implantation (triple surgery) on the patients of coexisting cataract and glaucoma. The IOP was controlled satisfactorily in all cases except one case required additional treatment of antiglaucoma drugs 78.9% patients achieved visual acuity 6/9 or more.

Ellinghous G. Detry morel M. 1995. evaluated the effect of triple procedure in 34 eyes of patients with coexisting cataract and glaucoma that underwent triple procedure. Phacotrabeculectomy was performed in 21 eyes. 13eyes received ECCE with trabeculectomy. Result showed mean decrease from preoperative pressure base line of 10.5 mm Hg within 1 month and patients achieved visual acuity 6/9 or more. Post operative hyphema and fibrinous anterior uveitis was seen in few cases.

Storr - paulsen A., perriard A. 1995 evaluated the effect of triple procedure in cataract patients with coexisting open angle glaucoma. Post operative median decrease in IOP was significant through a 12 months observation period. $P < 0.001$. Complication rate during operation and in post operative follow up period was low.



AIMS AND OBJECTIVES

AIMS AND OBJECTIVES

- To Study the Post operative intraocular pressure after triple procedure
- To Study visual acuity of operated eye after triple procedure



Material And Methods

MATERIAL AND METHOD

The present study is conducted at M.L.B. Medical College, Jhansi. It includes the cases of mature and submature cataract along with glaucoma, who were admitted to the Department of Ophthalmology. These were the cases requiring surgical intervention for both cataract as well as glaucoma. These glaucoma patients are those in which medical therapy had failed or the cases in which the surgery was inevitable.

The patients were of either sex and of more than 40 years of age. A total number of 60 patients were studied.

The following pattern was adopted for almost all the patients.

History of Present illness -

Any history of headache and eyeache, its severity, duration and association with vomiting, diminution of vision, coloured halos, redness, watering of eye was inquired and recorded. History of anti glaucoma therapy was asked if any.

Past History -

Regarding previous attack of some disease like trauma, vomiting diabetes or visual distrurbances if any was noted. Any history suggestive of previous trabeculectomy in other eye or cataract extraction or Intraocular lens implantation in other eye was taken.

Personal History -

History of smoking, tobacco chewing and addiction of alcohol or drug is taken.

Examination -

Systemic -

Recording of pulse, blood pressure, temperature, examination of central nervous system, respiratory system, cardiovascular system and G.I. tract

Local -

The local examination was done under bright illumination to examine the conjunctiva, cornea, anterior chamber iris, pupil and lens.

The slit lamp examination was done routinely particularly to examine the transparency of cornea, aqueous flare, keratic precipitates, extent of lenticular opacities. and

pigmentary dispersion over lens, to elicit pupillary reaction or perception of light in doubtful cases.

Investigations -

Routine - It includes urine albumin and sugar in all the cases and when even indicated blood sugar- fasting and post prandial was done. Also the total leucocyte count, differential leucocyte count, Haemoglobin and Erythrocyte sedimentation rate was confirmed.

Special -

- 1) *Visual acuity* - This was preoperatively recorded in term of snellen's test type. Finger counting , hand movement perception of light and projection of rays depending on the individuals visual status. Post-operatively after 1 week , 4 weeks , 6 weeks, the corrected visual acuity was recorded.
- 2) *Pupillary examination* - Pupils of both the eyes were seen for -
 - Pupillary reaction
 - Size of the pupil
 - Shape of the pupil

Direct pupillary reaction and consensual pupillary reaction were seen with the help of spot light.

Size and shape of the pupil were assessed with the help of torch.

Tonometry - It was performed with the schiotz tonometer with standard technique. Almost in all cases ; except in uncooperative patient where only digital tonometry was done. One particular schiotz tonometer was used preoperatively, post operatively and in follow up period.

Fundus examination - Both distant direct and direct ophthalmoscopy were done preoperatively & post operatively by Hiene's direct ophthalmoscope. Then for knowing peripheral details indirect ophthalmoscopy was also done. The condition of optic disc such as size, shape , colour, excavation, nasal shifting of the vessels and cup disc ratio were noted. Besides this any abnormality in the fundus was recorded.

Gonioscopy -

It was done in co-operative patients by golaman's three mirror gonioscope to assess mainly the angle status (open or

closed) Beside these the peripheral anterior synechia and neovascularisation of the angle, if any were noted.

Field charting -

Field charting was done in co-operative patients. Peripheral field charting was done with the goldmann's perimeter and central field with the Bjerrum's screen.

IOL Power calculation by biometry -

1. Keratometric readings in terms of dioptric power of the cornea or in terms of radius of curvature with keratometer were calibrated.
2. Axial length of the eye was calibrated with A scan ultrasound.

The both these reading were used in SRK II formula to know about the IOL power.

$$P = A - 2.5 L - 0.9 K$$

A = Specific constant

L = Axial length

K = Average of K_1 is K_2 calibrated by keratometer.

When the desired investigations were done the patient was subjected for medical therapy followed by surgical

intervention, whenever the operation was delayed the patient was put on acetazolamide and timolol eye drop.

Pre operative preparation -

The patient were mentally prepared to undergo cataract extraction with trabeculectomy and intra ocular lens implantation. To relieve the apprehension , anxiety and to have good sleep night before the operation alprazolam 0.25 mg tablet was given. The eye lashes were cut a day before. The intraocular pressure was controlled with acetazolamide 250 mg in suitable doses.

Anesthesia -

Topical - By instillation of 4% xylocaine 4-5 times at 2 mins interval.

Regional - By 2% xylocaine with adrenaline with hylinase given in peribulbar method and if necessary given by retrobulbar method.

Step of operation -

The operation was done under 7X magnification lieca microscope. After the lid and superior rectus suturing, fomix based conjunctival flap was formed.

Then a half thickness limbus based external scleral flap 5mm square or equilateral triangle was marked out. The corner of the scleral incision was lifted with fine toothed forceps and the flap was raised. It was raised forward until the ant 2 mm of its bed consist of cornea. Then trabeculectomy was done by making incision 2 mm long over clear cornea in front of scleral spur to enter anterior chamber and peripheral iridectomy was then performed.

Methylcellulose was then introduced in the anterior chamber and capsulotomy was done by can opener method with a cystitome formed by 26G. needle.

Proper hydrodissection was done and nucleus was delivered. Anterior chamber was now washed with Ringer's lactate using aspiration and irrigation technique and all the cortical matter was cleaned.

Anterior chamber was now reformed with the methylcellulose. PCIOL was implanted in the bag by either flexion or dialing method. Small prepheral iridectomy was done. Anterior chamber was washed by ringer lactate to remove all the methylcellulose. Lastly anterior chamber was formed using sterile air.

Then first stiches as needed were given to scleral flap made for trabeculectomy. Then corneoscleral stitches were given either continuous or interruppted. Then whole the wound was covered with conjunctival flap.

Post operative management -

A suitable antibiotic usually ciprofloxacin 500 mg two times a day with anti inflammatory drug were given to all patients for 3 days at least.

Dressing with cortecosteroid and antibiotic was done on the first day. Then from 2nd day onwards frequent instillation of corticosteroid with antibiotic drop were given.

The eyes were examined every day and post operative details were noted. If any sign of iritis was seen the combination of tropicamide with phenylepinine was given once daily in drop form. Particular attention was given on condition of section, wound, keratitis, anterior chamber depth and properly placed posterior chamber lens.

The follow up -

The patients were advised for the follow up examination at one week internal, for 2 weeks after discharge. Then every fortnight for 3 visits .

At follow up visit the eye was examined for filtering bleb, transparency of cornea, depth of anterior chamber condition of iris, properly placed lens. More emphasis was given on corrected visual acuity and intraocular pressure. All the findings were recorded for final assessment.



OBSERVATIONS

OBSERVATION

The present study of the simultaneous operation for cataract and preexisting glaucoma and intraocular lens implantation was carried out in the Department of Ophthalmology, M.L.B. Medical College, Jhansi during the period from May 1999 to July 2000. During this period 60 patients of cataract with preexisting glaucoma were operated by triple procedure and were followed up. The follow up of the patients varied in between 2 months to 6 months.

TABLE - I
Sex incidence

| Total number of patients | Females | Males |
|--------------------------|---------|--------|
| 60 | 40 | 20 |
| | 66.66% | 33.33% |

60 patients of cataract with glaucoma were operated. In these 60 patients, 40 patients were female i.e. 66.66% and 20 patients were male i.e. 33.33%

TABLE - II
Age Incidence

| Age Group | Number of Patients |
|------------------|---------------------------|
| 41 - 50 | 41 6.66% |
| 51 - 60 | 30 50% |
| 61 - 70 | 18 30% |
| 71 - 80 | 8 13.33% |

The age of the patients varied between 41 to 80 years.

Age group 41 - 50 included 4 (6.66%) patients. In age group 51 - 60 30 patients (50%). In age group 61 - 70 18 patients (30%). In 71-80 years age group 6 patients {13.33%} were operated.

The minimum number of 4 patients 6.66% were in age group 41 - 50.

The maximum number of 30 patients recorded in 5th and 6th decade i.e. 50 %.

TABLE - III
Type of Cataract

| Type of cataract | Number of Eyes | |
|------------------------------------|----------------|-----|
| Mature cataract with raised IOP. | 45 | 75% |
| Immature cataract with raised IOP. | 15 | 25% |

The maximum number of patients having mature cataract were 45 (75%) and 15 (25%) were having immature cataract with raised IOP.

Socio Economic Status :

We divided the patients according to socioeconomic status. There was no patient from upper class and upper middle class. Only 10 patients were from middle class (16.66%). 20 patients were from lower middle class (33.33%) 30 patients were from lower class (50%).

The maximum patients were from lower class i.e. 30 patients (50%).

TABLE - IV
Socio Economic Status

| Socio Economics Status | No. of Cases | Rural | Urban |
|-----------------------------------|---------------------|--------------|--------------|
| Middle Class | 10 16.66% | 8 | 2 |
| Lower Middle Class | 20 33.33% | 14 | 6 |
| Lower Class | 30 50% | 20 | 10 |
| Total | | 42 | 18 |

We further divided the patients from urban and rural area. The total number of patients from rural area were 42 (70%) and from urban were 18 (30%).

The presentation of symptoms -

The patients presented with gross visual deficit because of advanced lenticular opacities and glaucoma.

The patients presented with gradual diminution of vision with headache, eye ache, coloured halos, and few patients with congestion. These symptoms were varying from 6 months to 2½ years.

TABLE - V

Pre Operative Visual Status

| Vision | Number of eyes |
|-----------------|-----------------------|
| 6/36 | 8 13.33% |
| 6/60 - 1/60 | 33 55% |
| Finger counting | 9 15% |
| Hand Movement | 6 10% |
| PL + PR | 4 6.66% |
| Doubtful PL | 0 0 |

Table V shows preoperative visual acuity of 60 eyes. with cataract and preexisting glaucoma. 4 (6.66%) eyes had only positive PL.PR. 6 (10%) eyes had visual acuity hand movement and 9 (15%) had finger counting. The maximum 33 (55%) eyes were having visual acuity in between 1/60 - 6/60. 8 eyes (13.33%) had visual acuity in between 6/60 and 6/36.

TABLE - VI

Pre Operative Intra Ocular Pressure

| Preoperative Intraocular Pressure (mmHg) | Number of eyes |
|---|-----------------------|
| 21-25 | 12 (20%) |
| 26-30 | 33 (55%) |
| 31-35 | 10 (16.66) |
| 36-40 | 3 (5%) |

2 eyes were having IOP 50.3 mmHg.

12 (20%) eyes were having IOP in between 21-25 mmHg.

10 eyes (16.66%) were having IOP between 31-35 mmHg and 3 eyes were having between 36-40 mmHg.

The maximum number of 33 eyes were having IOP between 26-30 mmHg.

Other Eye -

The other eye invariably 42 were having raised IOP. 8 eyes had filtering operation. 6 eyes had triple procedure. 4 eyes had normal IOP.

TABLE - VII

Pre Operative anti glaucoma therapy

The anti glaucoma therapy was given to all the patients and is shown in table.

| Medicine | No. of patients | |
|------------------------------|------------------------|--------|
| - Timolol alone 0.5% | 33 | 55% |
| - Timolol 0.5% & pilocar 2% | 8 | 13.33% |
| - Timolol 0.5% Acetazolamide | 15 | 25% |
| - All above + mannitol | 4 | 6.66% |

The nonselective timolol 0.5% was given to maximum 33 patients (55%). Patients who did not respond well to timolol alone, pilocarpine 2% twice or four times a day were added. 8 patients (13.33%) were on timolol and pilocarpine 2%

15 (25%) patients were on Timolol 0.5% and 250mg acetazolamide in divided doses.

The IOP was controlled in all the patients except 4 patients. These 4 patients did not respond to above

medications and tension remained high. So intravenous manitol was given one hour prior to surgery.

TABLE - VIII

Pre operative Diagnosis

| Diagnosis | No. of eyes | |
|----------------------------------|--------------------|--------|
| - Ocular hypertension | 30 | 50% |
| - Chronic simple glaucoma | 32 | 36.66% |
| - Chronic angle closure glaucoma | 8 | 13.33% |

Datas in table VIII were only probable diagnosis dependent only on IOP and cup disc ratio because field charting can not be done due to lenticular opacities.

Surgical treatment was done as quickly as possible after the initial medical treatment. Trabeculectomy was done along with cataract extraction and posterior chamber intraocular lens implantation in all the 60 eyes in one stage operation and it is called as triple procedure.

Operative complications

The various complications occur preoperatively, intraopratively and immediately after operation. These are recorded in table IX & X.

1. *Pre operative* :- There was no preoperative complications.
2. *Intra Operative complication* :- These are recorded in table No. IX. Hyphaema was seen only in 6 eyes (10%). It was never massive enough to interfere with the operation and it was washed during suction and irrigation.
 - Iris injury was seen only in one eye.
 - The posterior capsule rent was there in 4 cases { 6.66% } But there was no vitreous prolapse in any case.

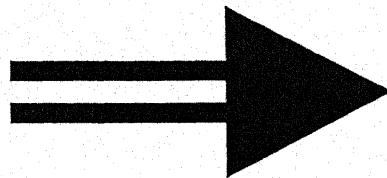


TABLE - IX

Intra Operative Complication

| Complication | Number of Eyes |
|---------------------|----------------|
| - Hyphaema. | 6 (10%) |
| - Iris injury | 2 (3.33%) |
| - P.C. rent | 4 (6.66%) |
| - Vitreous prolapse | 0 (0%) |

- The complication occurring within 15 days of follow up period were considered immediate or as early post operative complications and recorded in table no. X -

TABLE - X

Post Operative Complications

| Complications | No. of eyes |
|-------------------|-------------|
| Striate Keratitis | 6 (10%) |
| Shallow A.C. | 2 (3.33%) |
| Hyphatma | 0 (0%) |
| Intis | 4 (6.66%) |

Striate keratitis was seen in 6 cases 10%. It was cleared in all cases within 15 days of follow up.

Shallow Anterior chamber was observed in 2 cases (3.33%) on very first day post operatively and it was recovered within 2-3 days after pressure bandage application.

Iritis was seen in 4 cases 6.66% and it was fully cured within 7 days of frequent instillation of combined eye drops and tropicacil once a day.

Distortion of pupil was seen in 2 cases but they did not had any significant effect on visual acuity. They was no evidence of infection in any case.

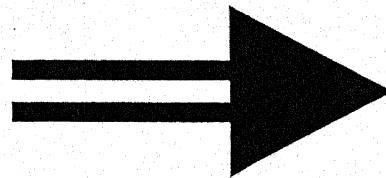


TABLE - XI

Post operative visual acuity after 1 wk. and 4 weeks

| | 1 Week | | 4 Week | |
|--------------|--------|--------|--------|--------|
| H M. - FC | 8 | 13.33% | 4 | 6.66% |
| 1/60 - 6/60 | 18 | 30% | 10 | 16.66% |
| 6/36 - 6/24 | 16 | 26.66% | 10 | 16.66% |
| 6/18 | 12 | 20% | 26 | 43.33% |
| 6/12 or more | 6 | 10% | 10 | 16.66% |

Table No. XI- Shows the visual acuity after 1 wk and 4 weeks.

After 1 wk. - 8 patients 13.33% were having visual acuity between Hand movement and finger counting. 18 patients (30%) were having visual acuity 1/60 - 6/60 , 16 (26.66%) patients were having 6/36 - 6/24 . 12 patients (20%) were having visual acuity of 6/18.

6 (10%) cases had visual acuity 6/12 or more.

After 4 wk. - 4 (6.66%) patients were having visual acuity between Hand movement and finger counting. 10 patients (16.66%) Patients were having visual acuity 1/60 - 6/60 , 10 (16.66%) patients were having between 6/36 - 6/24. 26 patients (43.33%) were having visual acuity of 6/18. 10 (16.66%) had visual acuity 6/12 or more.

TABLE - XII

Visual Acuity pre operative and Post operative after 6 wks

| Visual Acuity | Pre Operative number of eyes | Post operative after 6 wks of eyes |
|---------------|---------------------------------|---------------------------------------|
| PL+nt | 4 (6.66%) | 0 (0%) |
| HM-FC | 15 (25%) | 4 (6.66%) |
| 1/60 - 6/60 | 33 (55%) | 6 (10%) |
| 6/36 - 6/24 | 8 (13.33%) | 8 (13.33%) |
| 6/18 | 0 (0) | 30 (50%) |
| 6/12 or more | 0 (0) | 12 (20%) |

Above Table No. XII - shows the preoperative and post operative visual acuity after 6 weeks

Post operative after 6 weeks visual acuity was Hand movement to finger counting in 4 eyes (6.66%) Between 1/60 and 6/60 in 6 eyes (10%). Between 6/36 - 6/24 in 8 eyes (13.33%) 6/18 in 30 eyes (50%) 12 (20%) patients had 6/12 or more.

Best post operative visual acuity was between 6/18 and was there in 30 eyes (50%).

Out of 60 patients operated by triple procedure 54 (90%) patients achieved better visual acuity as compared to preoperative visual acuity. The visual acuity remained the same in 6 patients (10.00%) There was no patient in whom the visual acuity worsened.

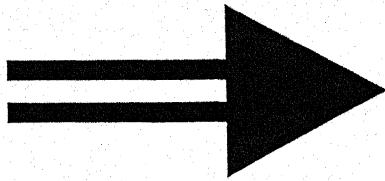


TABLE - XIII

Post operative intra ocular pressure after 1
wk, 4wk, 6 wk

| Intra ocular pressure mmHg | After 1 weeks | After 4 weeks | After 6 weeks |
|----------------------------|---------------|---------------|---------------|
| 11 - 15 | 14 (23.33) | 21 (35%) | 22 (36.66%) |
| 15 - 20 | 36 (60%) | 31 (51.66%) | 36 (60%) |
| 21 - 25 | 10 (16.66%) | 8 (13.33%) | 2 (3.33%) |

After 1 week intraocular pressure was between 11-15 mmHg in 14 eyes (23.33%) and between 15-20 in 36 eyes (60%) and between 21-25 in 10 eyes (16.66%).

The minimum recorded IOP after 1 weeks was 10.2 and maximum was 24.3 mmHg.

After 4 weeks intraocular pressure was between 11-15 mmHg in 21 eyes (35%), between 15-20 in 31 (51.66%) and between 21-25 in 8 (13.33%) eyes.

The intraocular pressure was above 22 mmHg in 8 eyes at the end of one month of follow up. All 8 cases were put on medical therapy out of which 6 (10%) were controlled while two cases remained uncontrolled at the and of 2 months of follow up.

After 6 weeks of follow up, 22 eyes (36.66%) had IOP between 11-15 mmHg. 36 eyes (60%) had IOP between 15-20 mmHg. only two had IOP between 21-25 mmHg.

At the and of follow up minimum recorded IOP was 10.2 mmHg and maximum was 24.3 mmHg.



DISCUSSION

DISCUSSION

Cataract and glaucoma often co-exist in elderly and geriatric people. We combined trabeculectomy with extra-capsular cataract extraction and posterior chamber intra ocular lens implantation {Triple Procedure} in whom cataract and glaucoma coexist. A single procedure which accompanies two purposes is much more desirable than two separate operations. It has got obvious advantages. Patient is financially & psychologically less burdened because of one surgery and one time hospitalisation. There is avoidance of prolonged use of medications, early restoration of vision, no problems of aphakia and second operation.

For these various reasons a number of authors have recommended the combined procedure. They include anterior sclerotomy with lens extraction (Wright 1937), Irridenleisis (Bierge, 1952), silerotomy with iris inclusion (Hughes 1959), sclerotomy with cautery (stocker 1965). Though on the whole results were good and operation justified, all were concerned about flat A/c, heammorhage and loss of vitreous and endophthalmitis.

Then the most celebrated entry of trabeculectomy was there. It has been shown to be a effective and safe operation in patients of glaucoma with cataract. {Shmeleva 1972 , Hilsdarf , 1974). The trabeculectomy has the advantage of guarded filtering wound. SO better glaucoma control can be attained and there is possible avoidance of shallow or flat anterior chamber post operatively. Several authors in recent past have tried trabeculectomy with cataract extraction combined with lens implantation and reported faavourable results { Steighler 1978}.

So trabeculectomy and cataract extraction was combined with posterior chamber lens implantation in the present study for its further evaluation.

This series consisted of 60 patients of cataract with preexisting glaucoma. Triple procedure was done in all the 60 patients and follow up was done.

The age of the patients varied from 41 to 80 years. The maximum number of patients were between 51-70 yrs. of age. This shows that coexisting condition of cataract and glaucoma is basically a problem of geriatric people.

As for the sex is concerned 40 (66.66%) were female and 20 (33.33%) were male.

The most common type of cataract associated with glaucoma was mature cataract 45 (70%) and immature in 15 (20%).

Maximum patients belonged to rural background 42(70%) and 18 (30%) belonged to urban area. Maximum patients were from lower class 30 (50%).

This indicates that due to illiteracy and lower socioeconomic status the disease is more common in rural background and lower class.

The preoperative visual acuity was very low in our study because of advanced lenticular opacities with glaucoma. Only 8 patients out of 60 were having visual acuity 6/36. Maximum 33(55%) patients had visual acuity between 6/60-1/60. 9(15%) had only finger counting 6(10%) had Hm+nt . 4(6.66%) had PL-PR.

The preoperative intraocular pressure was between 21-25 mmHg in 12 (20%), 26-30 mmHg in 33 eyes (55%), 31-35

mmHg in 10(16.66%) and 36-40 in 3(5%) 2 eyes were having IOP of 50mmHg.

As a major disadvantage considered with the combined extraction with PCIOL implantation is high risk of complications. So this part will be discussed first.

Intra Operative -

In this series of cases reported hyphaema was seen in 6 cases (10%). The literature had only a few reports with the blood in the anterior chamber as operative complication. Dhar et al (1984) reported 7.4% cases had blood in the anterior chamber.

Iris injury

In our study only 2 (3.33%) had iris injury. It was reported in 11.4% eyes by Singh et al.

P.C. rent -

Only 4 (6.66%) eyes had P.C. rent. Pereival SPE (1984) reported 5% cases had P.C. rent.

In our series of study no case had vitreous prolapse.

Post operative complication -

1. Striate Keratitis :

In our study it was seen in 6(10%) cases. It was mild striae keratitis, which cleared up in all the eyes by the time of discharge. It never produced adverse effects on the visual outcome. Its incidence could have further been reduced by minimizing the instrument handling or corneal touching.

2. Iritis :

Post operative iritis was seen in 4 (6.66%) cases it is the common complication after surgery. It was moderate in nature. It was controlled in all the cases. Its incidence in other reported series of combined extraction is 10.2% (Edward 1980) and 4.5% (Sing et al 1979).

Shallow A.C. and Hypotony

Shallow A.C. was seen in 2 (3.33%) cases. In simple anterior trabeculectomy incidence of Hypotony was 33.3% (Dutta 1975) and 21.4% (Mital et al 1979). In combined cataract extraction posterior chamber lens implantation. K. Lematti G. Kalima (1982) recorded Hypotony in 37.2% of cases . Galin et al (1969) reported persistant lung Hypotony in

one (2.17%) eye when used cataract extraction with cyclodialysis.

The incidence of shallow or flat anterior chamber was although absent in Rich's series but are reported by others as being between 7% and 16%.

The chances of hypotony and shallow anterior chamber are justifiable in combined extraction as it could be because of over filtration itself.

Tension control -

The control of intraocular pressure was achieved without medical therapy in 52(86.66%) eyes. The success rate for eyes not receiving post surgical treatment in a series of similiar combined operation varied from 80 to 95% (Hilsdorf 1974, Bregeat 1975, Jernial & Lundstrom 1966 , Manjoor et al. 1981, Edward 1980 and wechaler & robinson 1980, Prasad et al 1988, Pereival 1985, simmons and Lituff 1987 Chen W and Lin Z 1995, Storr and Paulsen A 1995) Our results are favourable compared to these results. The control of Intraocular pressure with medical therapy was achieved in 6(10%) eyes of the end of 2 months. In only 2 eyes (3.33%)

tension was not controlled even after medical therapy. In these uncontrolled eyes filtering bleb was not formed.

In our series 52 (86.66%) had good filtering bleb with good reduction in intra ocular tension 6(10%) had bad filtering blebs and reduction in intraocular tension was achieved by post operative medication. 2(3.33%) had no filtering bleb.

Filtering bleb was seen in 74% surgically controlled. eyes (Klematti & Kalima 1982) 50% Jerndeal G Land strom 1976) and 55% (Mansoor et al 1981).

Wechsler & Robinson (1980) operated 70 eyes in 4 grps and analysed the results. The success rate in tension control was 40.5% in cataract extraction alone. The success rate was 65.5% when drainage operation was followed by cataract extraction. Success rate was 79% with combined operation other than trabeculectomy. Success rate was 91% when combined with trabeculectomy. So it is proved that best procedure is trabeculectomy with cataract extraction and following visual out come will confirm that along with combined procedure when IOL implantation is done that is the best { triple procedure } .

Visual Outcome -

As the pre operative visual acuity was less than 6/36 to only P.L probably because of advance lenticular opacities. Improvement of vision was expected in all the cases.

Out of 60 patients operated by triple produce 54 (90%) patients achieved better visual acuity as compared to pre operative visual acuity. The visual acuity remained the same in 6 (10%) patients. But visual acuity did not worsen in any case.

The marked visual impovement in 90% eyes is favourable comparable with the results of similiar procedure in other studies. As 95% eyes had improvement in studies of skorpikc , Gnad P, Parauss IOP. 89% achieved 6/12 or better in studies of Mc. cartney DL and meumen JE (1987) 78% in studies of Murchinson shields MR (1990).

86% in Longstaff S. wormald RP (1990) reported better visual acuity in 78.9%.

In our series of study the visual acuity preoperatively was between 1/60 - 6/60 in maximum number of eyes { 33 = 55% }

15 (25%) eyes had HM only . 4 eyes (6.66%) had PL. only. 8 eyes (13.33%) had vision better than 6/60.

Post operatively maximum (30=50%) eyes had vision 6/18. 12 eyes (20%) had visual acuity 6/12 or more.

So the visual acuity has improved significantly. The control of intraocular pressure and visual improvement in our study are rewarding at the expense of slight increase in rate of complication and it is needed long term follow up.



CONCLUSION



CONCLUSION

The present study of combined extraction with posterior chamber intraocular lens implantation i.e. Triple procedure was carried out in the Department of Ophthalmology ,M.L.B. Medical College, Jhansi between may 1999 to July 2000. 60 patients underwent this triple procedure. The review of observations and results lead to following concluding points.

1. Preexisting glaucoma and cataract is essentially a problem of old age.
2. The control of intraocular pressure is highly significant ($P<0.001$)
3. A good tension control is achieved. The tension was controlled surgically in 86.66% eyes but in others the medical therapy was required.
4. Filtering bleb is very essential for maintenance of filtration. A well guarded bleb is formed which is the base of better tension control.

5. There is early restoration of better vision in 90% cases as compared to pre operative vision.
6. The most common complications were hyphaema, striate keratitis and iritis which did not affect the visual outcome as they were well controlled.
7. Other complications such as hypotony or shallow anterior chamber were insignificant. Overall complication of triple procedure when compared to 2 separate operation were not significant.
8. There is definite advantage of patient both financially and psychologically.
9. The advantage of triple procedure is to avoid multiple surgeries and to avoid problem of aphakia, aphakic glaucoma.
10. It is safe, effective and valid alternative for patients of preexisting glaucoma and cataract.



BIBLIOGRAPHY

BIBLIOGRAPHY

1. Obstbaum SO, Galin MA. glaucoma cataract surgery and intraocular lensin wainstock MA International Ophthalmology clinics Boston, Little Brown G. Co. Inc. 1979 Vol. 19, 139-147.
2. Pereival SPB - Glaucoma triple procedure of Extracapsular cataract extraction. Posterior chamber lens implantation and trabeculectomy. Br. J. Ophthalmol . 1985 ; 69 ; 99-102.
3. Ohanesian RV, Kim EW ; A prospective study of combined extracapsular extraction posterior chamber lens implantation and trabeculectomy. J. Am intraocular implant SOC 1985 ; 11 : 142-145.
4. Savage JA, Belcher CD, et al : Extracapsular cataract extraction and posterior chamber intraocular lens implantation in glaucomatous eyes , Ophthalmology 1985 ; 92 : 1506-1516.

5. Harrington DO, cataract and glaucoma, Management of the coexisting conditions and discription of a new operation combining lens extraction with reverse cycodialysis , Am I ophthalmol 1966 ; 61, 1134-8.
6. Golm MA, Baras I., glaucoma and cataract A study of cyclodialysis - lens extraction Am J. ophthalmol 1969 ; 67.522-7.
7. Rich W, cataract extraction with trabeculectomy Trans ophthalmol Soc. UK 1974 ; 94, 458-67.
8. Richardson K7, glaucoma and pseudophakia. In rosen ES. Haming WH, Arnot EJ eds Intraocular lens implantation St. Louis Mosby, 1984 , 619-21.
9. Shields MB combined cataract extraction and glaucoma surgery, Ophthalmology 1982 ; 89, 231-7.
10. Spaeth GL. Management of patients of Glaucoma with cataract ophthalmic surgery 1980 ; 11 : 780-3.
11. Johns GE, Layden WE, combined trabeculectomy and cataract extraction Am J ophthalmol 1979, 88 973-81.

12. Witmer R, Rohen JW. combined cataract glaucoma operation. Trans ophthalmol Soc. UK 1976 ; 96, 256-61.
13. Edwards RS, Trabeculectomy combined with cataract extraction, a follow up study Br. J. Ophthalmol 1980, 64, 720-4.
14. Jerndal T, Landstrom M, Trabeculectomy combined with cataract extraction Am J ophthalmol 1976, 81 ; 227-31.
15. Collado Hornillos JA, Velarde R., Results of trabeculectomy combined with cataract extraction Ach Soc Esp. Oftalmos 1980 40-1271.
16. Luntz MII, Berlin M.S. combined trabeculectomy and cataract extraction Trans ophthalmos Soc. U.K. 1987, 100. 533-41.
17. Scuderi G, Balestrazzi E, combined operations for cataract a glaucoma clin oculist Potol ocular 1980, 5.16.
18. Wechsler A, Robinson V.P. simultaneous surgical management of cataract and glaucoma Aust J. ophthalmol 1980.8,151-60.

19. Bregeat P. cataract surgery and trabeculectomy at the same time. Klin Monatsbi, Augenheilkd 1975. 167:505.
20. Jay J. Extracapsular cataract extraction and posterior chamber intraocular lens insertion combined with trabeculectomy Br. J. Ophthalmol 69-407, 1985.
21. Haber C. and Rene . Lens implantation combined with trabeculectomy . Trans ophthalmol Sic. U.K. 104-574, 1985.
22. Shields M.B. combined cataract extraction and guarded sclerotomy. Re-evaluation in extracapsular era ophthalmology 93. 366, 1986.
23. Mc Guigan L. J.B. Gotts ch J., extracapsular cataract extraction and posterior chamber lens implantation in eye with preexisting glaucoma Arch. Ophthalmol 104 : 1301 1986.
24. Handa J, Hensy J.C. Krupi . ECCe and PCIOl implant in glaucoma patients ARVo abstracts, Supplements to investi Ophthalmol vis Sci Philadelphia J.B. 1986 P.167.

25. Donders (1862) cited by Duke elder's system of Ophthalmology London, Henny Kimpton 1969 :11, 387.
26. Galen cited by Duke elder's systems of ophthalmology. London, Henny Kimpton 1969 : 11.249.
27. Guyton J.S. choice of operation for primary glaucoma combined with cataract extraction Arch. Ophthalmol 1945 : 33, 265.
28. Klemetti A, Kalima T. combined trabeculectomy and cataract extraction A follow up study Arch Ophthalmol 1982:60:259.
29. Lee O.S. and wein J.E. results of operation for cataract and primary glaucoma Arch ophthalmology 1950: 44-275.
30. Mansoor A, Guahar A, Ghulam R.D.simultaneous operation for cataract and glaucoma. Ind J. Ophthalmol 1981, 29:153.
31. Prasad V.N. , Mool narain and Grover Sandeep combined trabeculectomy and cataract extraction Ind. J. Ophthalmol 1988. 36:156.

32. Simeleva V.V. : single stage cataract extraction and trabeculectomy vestn. Ophthalmol : 1972 ; 6 : 44.
33. Singh D., verma A, Singh M. combined cataract extraction with pre trabecular filtration Ind. J. Ophthalmol 1979 ; 27:66.
34. Wolfe O.D. glaucoma and cataract Tr. Iowa Med. soc. 1982 : 42 : 522.
35. Wachsler . A and Robinson L.P. simultaneous surgical management of cataract and glaucoma Aust. J. ophthalmol 1980 : 80 : 151.
36. Moreno J. : perspectives on cataract and glaucoma surgery, revista de Medicine dc La universided de Nauana 39(4) 35-40 1995. Oct.-Dec.
37. Chen Wl., Lin A, wang W, Gc I, Zhang Z. Wci Z., Trabeculectomy combined with ECCE and PCIOL, yen Ko Hsueh pao eye science 11 (4) : 205-7, 1995.
38. Tanihara H., Negi A., Akimoto M., Magita M, Long term surgical results of combined trabeculectomy ab externo

and cataract extraction. Ophthalmic surgery 26 (4) 316-24, 1995 Jul Aug.

39. Ellingaus G., Detry Morel M. hemang JM combined operation trabeculectomy crystalline lens extraction, PCIOL. Bulletein de la societe belge & ophthalmic 255-33-8 1995.
40. Wedrich A, Menapace R, Radax v., Popupanes P. Long term effect of combined trabeculectomy and small incision cataract surgery. Journal of cataract and refractive surgery 21(1) : 49-54 1995. Jan.
41. Hornova S, Kuchy Ka P, Fucik M. cataract extraction and Intraocular lens implantation in patients with glaucoma; ceskoslovenska Ophthalmologic 50 (3) ; 153-9 1994 Jun.
42. Kurtz SN, Melamed S., Blumenthal M, cataract and IOL implantation after remote trabeculectomy for sturge weber syndrome. Journal of cataract and refractive surgery 19(4) : 599-41, 1993 Jul.
43. Kozsival P., Liehneova T. implantation of IOL in patients with glaucoma ceskoslovenska ophthalmologic 49(2) : 81-9, 1993 Apr.

44. Cernea P. Enache D., The extraction of the crystalline lens with trabeculectomy in our angle glaucoma. Ophthalmologic 36 (2) 173-7 1992 Apr.
45. Longutaf, wormald RP, Mazover A, hitchings RA glaucoma triple procedure : efficacy of intraocular pressure 21 (11) 786-93 1990 Nov.
46. Fusco R,Guacci P,Ambrosio G,Murino M. Trabeculectomy and extracapsular cataract extraction with posterior chamber lens implantation a long term study Documenta ophthalmologica 74(4) : 3058 , 1990 Apr. Jul.
47. Naveh N, Kattan R, Glovinsky J., Blumenthal M. the long term effect on intraocular pressure of a procedure combining trabeculectomy and cataract surgery - as compared with trabeculectomy alone.
-
48. Burrano I,Ferrari M.ECCE and IOL implantation in glaucomatous eyes that had a filtering bleb operation Journal of cataract and refractive surgery 16(3):315-9 1990 May.
49. Wishari PK, Atkinson PL ECCE with PCIOL in patients of primary clrronic angle closure glaucoma. Effect on IOP control Eye - 3 (706-12) 1989.

50. Murchinson JR, Shield MR. An evaluation of three surgical approaches for coexisting cataract and glaucoma. *Ophthalmic surgery* 20 (6) : 393-8 1989 Jun.
51. Mc Cartney DL, Memnen JE , Stark WJ, The efficacy and safety of combined trabeculectomy, cataract extraction and intraocular lens implantation.
52. Simmons ST, Litoff D. Nichols DA Sherwood MB, Spaeth GL. ECCE and PCIOL implantation combined with trabeculectomy in patients with glaucoma. *American Journal of ophthalmology* 104(5) : 465-70, 1987 Nov. 15.
53. Skorpik, Gnad HD, Paroussis P, Menapase Trabeculectomy and intraocular lens implantation - a combined procedure. *Journal of cataract and refractive surgery* (13) 1, 39-42 1987 Jan.
54. Civerchia 11, Nalent A. Intraocualr lens implantation in acute angle closure glaucoma associate with cataract. *Journal American Intraocular Implant Society* 11(2) 171-3 1985 Mar.

